EXHIBIT D

2022-1866, 2022-1867, 2022-1868

United States Court of Appeals for the Federal Circuit

GOOGLE LLC,
Appellant

v.

SINGULAR COMPUTING LLC,
Appellee

Appeals from the United States Patent and Trademark Office, Patent Trial and Appeal Board in Case Nos. IPR2021-00155, IPR2021-00165, and IPR2021-00179

CORRECTED NON-CONFIDENTIAL REPLY BRIEF OF APPELLANT GOOGLE LLC

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UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

CERTIFICATE OF INTEREST

Case Number 2022-1866, 2022-1867, 2022-1868

Short Case Caption Google LLC v. Singular Computing LLC

Filing Party/Entity Google LLC

Instructions: Complete each section of the form. In answering items 2 and 3, be specific as to which represented entities the answers apply; lack of specificity may result in non-compliance. **Please enter only one item per box; attach additional pages as needed and check the relevant box**. Counsel must immediately file an amended Certificate of Interest if information changes. Fed. Cir. R. 47.4(b).

I certify the following information and any attached sheets are accurate and complete to the best of my knowledge.

Date: 02/03/2023

Signature: /s/ Nathan R. Speed

Name: Nathan R. Speed

1. Represented Entities. Fed. Cir. R. 47.4(a)(1).	2. Real Party in Interest. Fed. Cir. R. 47.4(a)(2).	3. Parent Corporations and Stockholders. Fed. Cir. R. 47.4(a)(3).
Provide the full names of all entities represented by undersigned counsel in this case.	Provide the full names of all real parties in interest for the entities. Do not list the real parties if they are the same as the entities. ☑ None/Not Applicable	Provide the full names of all parent corporations for the entities and all publicly held companies that own 10% or more stock in the entities. ☐ None/Not Applicable
Google LLC		XXVI Holdings Inc.; Alphabet Inc.

☐ Additional pages attached

4. Legal Representatives. List all law firms, partners, and associates that (a) appeared for the entities in the originating court or agency or (b) are expected to appear in this court for the entities. Do not include those who have already entered an appearance in this court. Fed. Cir. R. 47.4(a)(4).

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5. Related Cases. Provide the case titles and numbers of any case known to be pending in this court or any other court or agency that will directly affect or be directly affected by this court's decision in the pending appeal. Do not include the originating case number(s) for this case. Fed. Cir. R. 47.4(a)(5). See also Fed. Cir. R. 47.5(b).

☐ None/Not Applicable ☐ Additional pages attached

Singular Computing LLC v. Google LLC	1:19-cv-12551	(DMA)

6. Organizational Victims and Bankruptcy Cases. Provide any information required under Fed. R. App. P. 26.1(b) (organizational victims in criminal cases) and 26.1(c) (bankruptcy case debtors and trustees). Fed. Cir. R. 47.4(a)(6).

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CONFIDENTIAL MATERIAL OMITTED

The material redacted from this brief on pages 27-29 is subject to a protective order issued by the Patent Trial and Appeal Board in IPR2021-00155, IPR2021-00165, and IPR2021-00179. The redacted material quotes an expert declaration filed under seal and the quoted material summarizes technical details of PowerPoint presentations that are subject to a non-disclosure agreement.

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INTRODUCTION[1]

By dismissing its cross-appeals, Singular has conceded that devices containing "at least one" low-precision high-dynamic-range (LPHDR) execution unit were obvious at the time of the alleged invention. The question remaining is whether the Board incorrectly concluded that Google had not proven that devices containing ***more than one*** such execution unit (*e.g.*, "at least one hundred") also would have been obvious. On that question, the Board's decisions rest on legal error and factual findings that lack substantial evidence support.

Unable to dispute Google's legal argument that economic costs alone cannot defeat an otherwise technologically motivated combination, Singular seeks to rewrite the Board's decisions as premised on alleged technological incompatibility between Dockser and MacMillan. But the Board's decisions are explicitly premised on the "increased costs" allegedly associated with using Dockser's FPPs in MacMillan's PEs, not any technological challenges POSAs would face pursuing the combination or any technological drawbacks with the resulting Dockser-MacMillan device. Reasonably read, the Board's decisions lay bare the Board's legal error.

[1] Emphasis added throughout.

On the facts, Singular hides behind the substantial-evidence standard, and asks the Court to perpetuate the Board's error of not considering the full record. Google is not asking the Court to re-weigh the evidence, but to apply the right law to the full record. When doing so, the conclusion that POSAs would have been motivated to pursue Google's combinations is the only reasonable one to be drawn.

Finally, the dismissal of Singular's cross-appeals makes final the Board's secondary-considerations findings, obviating the need for remand. And Singular's alternative basis for affirmance—applicable to Google's Dockser-MacMillan combination, but not its customized Dockser-MacMillan-Tong combination—relies on a claim interpretation the specification does not support. The Court should decide that legal issue now, eliminating the only plausible remaining reason for remand.

ARGUMENT

I. THE BOARD ERRED IN CONCLUDING THAT POSAS WOULD LACK MOTIVATION TO COMBINE DOCKSER WITH MACMILLIAN.

The substantial-evidence standard involves examining "the record as a whole, taking into account evidence that both justifies and detracts from an agency's decision." *In re Gartside*, 203 F.3d 1305, 1312 (Fed. Cir. 2000). When the full record is examined and the correct law applied, no reasonable factfinder could arrive at the Board's finding that POSAs would not have been motivated to combine Dockser with MacMillan.

A. POSAs Indisputably Had Technological-Based Motivations to Combine Dockser with MacMillan.

Singular has never disputed that using Dockser's FPP in the PEs of MacMillan's personal computers (*e.g.*, laptops) would result in devices that achieved the benefits of both references' inventions, *e.g.*, laptops with increased computing performance from MacMillan's SIMD architecture while consuming less power by using Dockser's FPPs to adjust the precision with which they operate. Opening Br. 19-20, 36, 51-53. Nor has Singular disputed that reduced power consumption and increased performance were desirable attributes for battery-powered devices like laptops. Appx1275-1280; Appx7124-7129; Appx8883-8888.

The facts underlying Google's motivation-to-combine case remain straightforward and compelling. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

B. The Board's Decision Was Improperly Premised on Economic—Not Technological—Concerns.

Rather than dispute Google's technical reasons for combining Dockser with MacMillan, Singular argues those reasons are trumped because MacMillan "bases its inventive purpose on minimizing costs" (Singular Br. 29) and thus allegedly teaches away from the combination. But while maintaining on one hand that MacMillan's "inventive purpose" is "minimizing costs," Singular on the other hand tries to re-cast that cost-driven "purpose" as technologically driven in an attempt to

rewrite the Board's decision as being based on "technological incompatibility" between Dockser and MacMillan. Singular Br. 30. Specifically, Singular argues that Dockser's FPPs are "indisputably more complex" than MacMillan's allegedly "simple PEs," and thus Dockser's FPPs are technologically incompatible "with MacMillan's objective of reducing cost by reducing complexity." Singular Br. 29.

Singular's attempt to rewrite the Board's motivation-to-combine finding as based on "technological incompatibility" is a concession that, as Google explained, economic costs alone—even when explicitly identified as a concern in the prior art being modified—cannot bar an otherwise obvious combination. Opening Br. 37-42 (citing *In re Farrenkopf*, 713 F.3d 714 (Fed. Cir. 1983)). Simply put, Singular cannot and did not dispute that this Court's cases stand for the proposition that economic costs alone cannot operate to bar an otherwise obvious combination. Singular Br. 29-32. Unable to dispute the law, Singular tries to avoid reversal by rewriting the Board's decisions as being about technological incompatibility. But Singular's rewrite is unsupported. The Board made no finding that POSAs would face technological challenges using Dockser's FPP in MacMillan's PEs or that the combination would result in inoperable devices. Opening Br. 39-40 (detailing combination's technical ***compatibility***).

Instead, the Board said Dockser's FPPs were some unknown amount larger and more complex than the pre-existing floating-point accelerators within

MacMillan's PEs, and thus Dockser's FPPs would increase the PE's manufacturing ***cost***. Appx74-76; Appx158-161; Appx244-247. Although couched in terms of "complexity" and "size," the Board recognized that the reason MacMillan cautioned against "significant complexity" and "size" was to avoid the "***increased costs*** associated with added complexity and size." Appx75; Appx159; Appx245; *see also* Appx72; Appx242-243; Appx156-157; Opening Br. 37, 41-42. The only reasonable reading of the Board's decisions is that they were premised on the "cost" associated with the Dockser-MacMillan combination, not any technological incompatibility with making it. The decisions were thus based on a legally erroneous premise (economic costs), despite Singular's attempt to rewrite them as being based on a legally acceptable one (technological incompatibility). Reversal is required given this fundamental legal flaw in the Board's reasoning.

Although Singular does not dispute Google's understanding of the law, Singular does argue that one case Google cited, *Grit Energy Sols. LLC v. Oren Techs., LLC*, 957 F.3d 1309 (Fed. Cir. 2020), "does not support Google's argument" because the Court said increased "cost" might cut against the petitioner's motivation-to-combine theory. Singular Br. 32. But in *Grit Energy*, the petitioner affirmatively identified cost-savings as motivating the combination, and thus a finding that no such savings would occur was properly considered. 957 F.3d at 1323. Here, Google never argued POSAs would pursue Dockser-MacMillan because it

yielded cheaper laptops; Google argued increased computational power and energy efficiency motivated the combination.

Moreover, the Court in *Grit Energy* further explained that although cost might be relevant to rebut a cost-savings rationale, it does not "detract" from the petitioner's ***other*** technological-based rationale because cost alone cannot defeat a technological-based motivation-to-combine rationale. *Id.* at 1323-24. *Grit Energy* supports Google's argument.

Because the Board's motivation-to-combine finding is premised on concerns with the Dockser-MacMillan combination's financial cost and not technological incompatibility, reversal is required.

C. No Reasonable Factfinder Could Read MacMillan to Teach Away from Combining Dockser with MacMillan.

Given the Board's legal error in relying on only financial concerns with the Dockser-MacMillan combination to find a motivation to combine lacking, this Court need not consider whether MacMillan's financial concerns (if relevant) would have taught away from that combination. But should the Court consider that question, the record confirms MacMillan does not teach away from combining Dockser with MacMillan.

To teach away, MacMillan would need to "criticize, discredit, or otherwise discourage" the use of Dockser's FPPs in MacMillan's PEs. *General Elec. Co. v. Raytheon Techs. Corp.*, 983 F.3d 1334, 1345 (Fed. Cir. 2020). Even if MacMillan

had expressed technical concerns with "significant complexity" and added "size," rather than with the financial costs associated therewith (MacMillan does not), no reasonable factfinder could interpret the record as supporting the Board's findings that (i) Dockser's FPPs introduce the type of "significant complexity" and added "size" that concerned MacMillan or (ii) that Dockser's FPPs add any costs at all.

1. MacMillan is concerned about costs associated with the "significant complexity" and size of supercomputers.

MacMillan's invention is a SIMD parallel-processing architecture for, as the Board observed, "***adding*** supercomputer performance to a computer for personal use," *e.g.*, laptops. Appx67; Appx152; Appx238; Appx1499 (5:49-6:45). MacMillan starts with a personal computer and ***adds*** a novel SIMD subsystem to provide the computer with, as the Board explained, "much higher performance computing at ***moderate cost***." Appx72 (quoting Appx1500 (8:51-55)); Appx157; Appx243; Singular Br. 16 (MacMillan "provid[es] supercomputing capabilities, without incurring ***substantial*** cost or ***unnecessary*** complexity").

MacMillan explains that its SIMD architecture "allow[s] supercomputing performance to be provided in a low cost computer system for personal use, dramatically expanding the potential market for systems with supercomputing performance." Appx1499 (5:38-43); Appx1497 (1:15-23). MacMillan further explains that to meet this "cost objective," its architecture "should not add significant complexity to the architecture of [personal computers]." Appx1499 (5:43-45).

MacMillan also identifies "limitations" of prior-art SIMD designs, some of which, the Board said, "relate to increased costs from added complexity…size, etc." Appx72; Appx157; Appx243.

The Board seized on MacMillan's "cost objective" reference and its caution against "significant complexity" (or added size) to find MacMillan "would have dissuaded" POSAs from using Dockser's FPP in MacMillan's PEs because that would purportedly add complexity and size to the PEs, and therefore increase their cost. Appx73-76; Appx157-158; Appx243-245. But MacMillan's disclosures cannot be read in a vacuum. The salient question is what level or type of costs, "significant complexity," and added size MacMillan was discussing.

MacMillan's disclosure yields only one reasonable answer—it was concerned about the cost, complexity, and size of then-existing ***supercomputers***. Opening Br. 16-17, 37-38, 42, 47. As MacMillan explains, then-existing supercomputers were more powerful than personal computers but "typically cost $100,000 or more." Appx1497 (1:15-23); Appx1499 (5:25-27). MacMillan's "cost objective" was to keep personal computers at prices below the prohibitively expensive prices of supercomputers, and MacMillan's caution against cost, "significant complexity," and added size must be understood in that context.

Rather than confront what MacMillan says, Singular argues Google waived any argument regarding MacMillan's context. Singular Br. 35-36. But both Google

and Mr. Goodin consistently described MacMillan as disclosing SIMD architectures for adding supercomputing performance to "low cost" laptops to avoid the "much higher cost" associated with prior-art supercomputers. Appx1271-1273 (¶¶ 347-349); Appx7120-7122; Appx8879-8881; Appx712; Appx6417-6418; Appx8390-8391. MacMillan's supercomputer context (and thus the costs, complexity, and size associated with those computers) was always at issue. *Wm. Wrigley Jr. Co. v. Cadbury Adams USA, LLC*, 683 F.3d 1356, 1360-61 n.3 (Fed. Cir. 2012) (no waiver where party "presented the essence of its present arguments" below).

Singular notes that Google's reply brief below emphasized Singular's lack of evidence on the "cost" issue (and its legal irrelevance), rather than MacMillan's supercomputer context. Singular Br. 35-36; Appx5051-5052; Appx7973-7974; Appx9752-9753. Google did so because once Google established technological reasons POSAs had for combining Dockser with MacMillan, Singular had a "burden to proffer opposing evidence." *Ethicon LLC v. Intuitive Surgical, Inc.*, 2022 WL 1613188, at *3 (Fed. Cir. 2022). Singular offered ***no such opposing evidence***, and relied instead on conclusory expert testimony regarding costs, generally, that parroted an argument the Board already said at institution was not "sufficient." Appx4008; Appx7669; Appx9479; Appx4992-4993; Appx7915-7916; Appx9693-9694.

Not until the oral hearing did Singular suggest MacMillan ***itself*** was evidence showing that Dockser's FPPs would increase costs because the FPPs include an additional control register and MacMillan purportedly said adding registers to PEs increases costs. Appx6206-6207; *infra* pp. 15-16. In response, Google immediately pointed out that there was no evidence "that whatever MacMillan is talking about [regarding registers] is something that happens in Dockser's PE" and that MacMillan's discussion about registers was about a "specific" prior-art design. Appx6207-6208. Google thus made clear, in response to Singular's belatedly presented argument, that any specific ***costs*** MacMillan expressed concerns about, *i.e.*, particular costs arising due to specific designs found in prior-art supercomputers, had no relevance to Dockser-MacMillan. The Board was "fairly put on notice as to the substance of the issue," and no waiver has occurred. *Nelson v. Adams USA, Inc.*, 529 U.S. 460, 469-70 (2000).

Despite recognizing that MacMillan's cost discussion occurred in the context of supercomputers, neither the Board nor Singular ever accounted for that context. Appx71-72; Appx156-157; Appx242-243. Unsurprisingly then, nothing in the record suggests Dockser's FPPs would add the supercomputer-type costs associated with "significant complexity" and added size that concerned MacMillan. Read within its full context, MacMillan's "concerns" about cost, complexity, and size cannot reasonably be interpreted to teach away from Dockser-MacMillan.

2. Even if MacMillan were concerned with adding "significant complexity" or cost, generally, nothing in the record supports finding that Dockser's FPPs would add either.

Putting aside MacMillan's supercomputer context, MacMillan would still not teach away from Dockser-MacMillan even if MacMillan were concerned about ***any*** costs associated with "complexity and size ***generally***," as Singular suggests. Singular Br. 35. No reasonable factfinder could find that (1) Dockser's FPPs add significant complexity to MacMillan's PEs, or (2) any added size Dockser's FPPs might introduce would add more than the "moderate costs" MacMillan already says is acceptable. Appx1500 (8:51-55).

a. No reasonable factfinder could find that Dockser's FPPs would add "significant complexity" to MacMillan's PEs.

Starting with complexity: Although Singular wants to characterize MacMillan's teaching as cautioning against ***any*** complexity (Singular Br. 3, 22, 39), MacMillan cautions only against "***significant*** complexity." Appx1499 (5:38-42). This makes sense because MacMillan's own invention necessarily adds ***some*** complexity (and "moderate cost")—in the form of a SIMD architecture—to pre-existing personal computers that lacked such architecture. Appx1499 (6:1-14) ("cost-effective ***addition*** of parallel processing"; "scalable performance at ***various*** price points"); Appx1500 (8:51-55); Appx72 (explaining MacMillan adds "SIMD computing capability…to personal computers…at moderate cost"); Appx157;

Appx243; Singular Br. 16 (MacMillan adds "supercomputer capabilities, without incurring ***substantial*** cost or ***unnecessary*** complexity"). The question therefore is whether a reasonable factfinder could find that Dockser's FPPs would add "significant" complexity (and thus more than "moderate cost") to MacMillan's PEs.

Singular repeatedly calls Dockser's FPPs "more complex" than a conventional floating-point unit. Singular Br. 3, 27-29. The Board likewise said they were more complex. Appx74; Appx158-159; Appx244-245. But ***nothing*** in the record supports Singular's and the Board's characterization of Dockser's FPPs.

First, nothing in the record provides the details (and thus the pre-existing complexity) of MacMillan's PEs. As Singular's own expert Dr. Khatri conceded, MacMillan's PEs are, effectively, a blank canvas. Appx5318 (141:9-11) ("[T]he person who practices MacMillan would decide what to put in the PEs, I suppose."). Singular's attorneys repeatedly say MacMillan's PEs are "simple," "small," or "low-cost." Singular Br. 3, 6, 28-29. But Dr. Khatri agreed MacMillan does not describe its PEs "in detail" and "only briefly" notes that they include a floating-point accelerator. Appx4973 (¶ 57); Appx7896; Appx9674. As Dr. Khatri explained, MacMillan "has no opinion" on "what [the PEs] contain." Appx5316 (139:8-25); Appx5317-5318 (140:1-141:15). Singular's attempt to paint MacMillan's PEs as simple, small, or low-cost to draw a contrast with Dockser's FPPs has no support.

Second, nothing in the record supports characterizing Dockser's FPPs as more complex than the pre-existing floating-point accelerators in MacMillan's PEs. Contrary to Singular's suggestion (Singular Br. 34), Dr. Khatri never said Dockser's FPPs "would increase…[the] complexity" of MacMillan's PE. Instead, he was focused on some unknown size increase the FPPs would add due to additional circuitry the FPPs purportedly required. Specifically, Dr. Khatri said that Dockser's FPPs are "*larger*" than traditional full-precision units because they include "additional control circuits" that require more chip space. Appx4970 (¶ 51) (emphasis original); Appx4992-4993 (¶¶ 103-104); Appx7893; Appx7915-7916; Appx9671; Appx9693-9694. Dr. Khatri never equated Dockser's "additional control circuits" with adding "complexity" to MacMillan's PEs, much less the "significant complexity" MacMillan mentions.

Similarly, contrary to Singular (Singular Br. 34-35), Mr. Goodin never said adding Dockser's FPPs to MacMillan's PEs "would increase MacMillan's complexity." As Google explained (Opening Br. 45-46), Mr. Goodin said that Dockser's FPPs included "circuitry" that allows for the FPPs' precision to be adjusted. He never said such "circuitry" would add complexity to MacMillan's PEs, much less significant complexity.

The only remaining evidence Singular points to is Dockser itself. Singular Br. 33-34. But all the Board observed is that Dockser's FPPs had a "floating-point

controller 130 and control register 137, that allows selection of a subprecision for floating-point operations." Appx72; Appx156; Appx242. Nothing in the record—*e.g.*, expert testimony—supports the Board's inferential leap that POSAs would have viewed Dockser's controller and register to add "complexity" to MacMillan's PEs. *In re Zurko*, 258 F.3d 1379, 1385-86 (Fed. Cir. 2001) ("[T]he Board cannot simply reach conclusions based on its own understanding or experience[.]"). Indeed, MacMillan's invention itself ***adds*** registers—"address limit registers"—to its PEs and MacMillan never suggests that such added registers introduced complexity in 1995 when MacMillan was published, let alone in 2009 when Singular filed its original patent application. Appx1503 (14:52-62).

No reasonable factfinder, viewing the full record, could find that Dockser's FPPs add complexity to MacMillan's PEs, much less the "significant complexity" MacMillan said should be avoided to meet its cost objective.

b. No reasonable factfinder could find that any size Dockser's FPPs might add would make MacMillan's PEs more costly.

That leaves only the Board's finding that Dockser's FPPs would add "size" and thereby "increase[] costs." Appx75; Appx159; Appx245. Dr. Khatri said POSAs would expect Dockser's FPPs to be larger than conventional floating-point accelerators. Appx4970 (¶¶ 50-51), Appx4992-4993 (¶¶ 103-104); Appx7893; Appx7915-7916; Appx9671; Appx9693-9694. Even if Dockser's FPPs would add

some size, nothing in the record suggests that such added size would make MacMillan's PEs more costly to manufacture.

As Google explained (Opening Br. 45), Dr. Khatri only offered conclusory testimony that the "additional circuitry and chip space" Dockser's FPPs allegedly introduce would "*increase* costs." Appx4993 (¶104) (emphasis original); Appx7916; Appx9694. Conclusory testimony "does not qualify as substantial evidence," *TQ Delta, LLC v. Cisco Sys., Inc.*, 942 F.3d 1352, 1358-59 (Fed. Cir. 2019), and Singular does not genuinely defend Dr. Khatri's analysis. Singular Br. 34. Instead, Singular abandons Dr. Khatri and argues "MacMillan itself" demonstrates that Dockser's additional circuitry adds size and thus increases costs. *Id.* But no reasonable factfinder could read MacMillan's disclosures as being applicable to Dockser's FPPs.

As Singular notes (Singular Br. 34), the Board said MacMillan describes "limitations of known SIMD designs" that relate to "increased costs" from added "size." Appx72; Appx157; Appx243. Specifically, MacMillan explains that some prior-art SIMD supercomputers had a "large register set on each PE" to temporarily store data locally, which "increases die area per PE, resulting in higher costs per PE." Appx1497 (2:56-61).

Although never discussed by Dr. Khatri, Singular now repeatedly cites MacMillan's "large register set" disclosure. Singular Br. 16, 26-27, 34. Presumably,

Singular wants the Court to believe that Dockser's FPPs require "large register set[s]," yet there is no evidence supporting that suggestion. As the Board itself explained, Dockser's FPPs require only a ***single*** "register" to select different precision levels; they do not require an additional "large register ***set***" to store data. Appx72-73; Appx157; Appx243. Nothing in the record suggests that any cost associated with adding a single register to a PE approaches the costs associated with adding the prior-art "large register set" MacMillan identifies. *Cf.* Appx5112 (¶ 31) (no evidence the FPPs' control circuitry would "increase cost ***at all***, much less to any appreciable degree") (emphasis original); Appx8034; Appx9813. Indeed, as discussed above, MacMillan's invention already ***adds*** registers to its PEs, and MacMillan never suggests doing so adds more than acceptable "moderate cost." Appx1500 (8:51-55), Appx1503 (14:52-62).

Singular also cites (Singular Br. 16, 34)—but does not discuss—MacMillan's explanation that an alternative prior-art approach that avoided using a "large register set" was to add more "pins" between the PEs and a device's memory chips, but doing so "increased packaging" and "die area" costs. Appx1497-1498 (2:62-3:2). No one—not even Singular on appeal—contends that Dockser's FPPs would introduce additional pins or approach the additional costs MacMillan identifies as associated with doing so.

Nothing in the record supports a finding that Dockser's FPPs would increase the size of MacMillan's PEs by the same amount (and thus with the same associated costs) that MacMillan said was a drawback to prior-art SIMD supercomputers. MacMillan's caution against added size (and associated costs) therefore cannot teach away from combining Dockser with MacMillan because MacMillan's teaching relates to size increases unrelated to the combination. *In re Ethicon, Inc.*, 844 F.3d 1344, 1351 (Fed. Cir. 2017) (teaching away requires "clear discouragement").

Finally, even if MacMillan was concerned not just about the added size (and associated costs) MacMillan actually discusses, but also more generally concerned about ***any*** added size that results in ***any*** added costs, MacMillan would still not teach away from using Dockser's FPPs, because the record confirms Dockser's FPPs would ***save costs*** overall. As Google explained (Opening Br. 46), using Dockser's FPPs reduces power consumption, and thus would reduce the need for "power supply capacity and ***cost***," which MacMillan explicitly identifies as another limitation with prior-art supercomputers. Appx1498 (3:2-6). If cost-based limitations of prior-art supercomputers are relevant, then the Dockser-MacMillan combination addresses one of them and gives POSAs yet another reason to pursue the combination.

Singular's only response is that Google waived any argument about cost-savings (Singular Br. 36); but Google explicitly made this argument before the

Board. Appx5052 (citing Appx5112 at ¶ 31, which explains there was no evidence Dockser's FPPs "would increase cost, much less that any such increase would outweigh the cost decrease gained by Dockser's power savings"); Appx7974; Appx9753; Appx8034; Appx9813; Appx6184 ("Dockser's units would be a cost decrease"); Appx6086.

D. Obvious Combinations Need Not Be the Best Ones.

Singular does not dispute that a combination need not be the "*best* option, only that it be a *suitable* option." *Intel Corp. v. Qualcomm, Inc.*, 21 F.4th 784, 800 (Fed. Cir. 2021) (emphasis original); Opening Br. 48-51. Singular argues instead that MacMillan's "cost" discussion is not merely a preference, but an explicit teaching away. Singular Br. 36-39. But as shown *supra* Sections I.B-C, MacMillan's concerns about cost associated with supercomputers are both legally and factually irrelevant to the Dockser-MacMillan combination and therefore cannot "teach away" from it.

Regardless, MacMillan's concerns about cost do not rise to the level of teaching away from ***any*** potential cost increase. Indeed, MacMillan itself ***adds*** "moderate cost" to conventional laptops. Appx1500 (8:51-55); Appx1499 (6:10-14) ("scalable performance at various price points"); Appx72 (recognizing MacMillan adds "moderate cost" to personal computers); Appx157; Appx243; Singular Br. 16 (MacMillan avoids "***substantial*** cost"). All else being equal, MacMillan may ***prefer***

the cheapest computer, but MacMillan does not teach away from adding any costs. *Intel*, 21 F.4th at 801 ("[T]he intended purpose of [prior-art reference] does not control [the obviousness inquiry].").

Singular attempts to analogize MacMillan's disclosure to disclosures the Court has previously found taught away from combinations. Singular Br. 37-38. As Google explained (Opening Br. 43), Singular's cases involve technological incompatibility, not financial concerns, and are thus inapposite. Moreover, those cases involved disclosures that identified the proposed combination as more than simply undesirable but rather, *e.g.*, "***inoperable***." *In re Gordon*, 733 F.2d 900, 902 (Fed. Cir. 1984); *Chemours Co. FC, LLC v. Daikin Indus., Ltd.*, 4 F.4th 1370, 1375-78 (Fed. Cir. 2021) (reference taught away from removing "key feature"); *TriVascular, Inc. v. Samuels*, 812 F.3d 1056, 1068 (Fed. Cir. 2016) (reference taught away from "destroy[ing]" its "basic [technical] objective"). Nothing in the record could reasonably support a finding that using Dockser's FPPs within MacMillan's PEs would make MacMillan's laptop inoperable, remove from it a key feature, or destroy its basic technical objective, *i.e.*, increased computing performance.

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The Board's motivation-to-combine finding regarding Dockser-MacMillan should be reversed, and remand is unnecessary for the reasons discussed *infra* Sections III-IV.

II. THE BOARD ERRED IN CONCLUDING THAT POSAS WOULD LACK MOTIVATION TO COMBINE A CUSTOMIZED VERSION OF DOCKSER WITH MACMILLAN IN VIEW OF TONG.

The Board found POSAs would not have customized Dockser's FPPs to operate only at less-than-full precision levels because operating at full precision was "a fundamental feature of Dockser and Tong." Appx80; Appx164; Appx251. No reasonable factfinder could make that finding. The Board's separate finding that customizing Dockser's FPPs would introduce complexity and cost is legally irrelevant and factually unsupported.

A. The Record Confirms that Full-Precision Capability Was Not Fundamental to Either Dockser or Tong.

1. Dockser is explicit that full precision is not always necessary.

As Google explained (Opening Br. 58), Dockser teaches that its FPP's register file can be "formatted differently from IEEE 32-bit," *i.e.*, different from full precision. Appx1471 ([0017]). As Mr. Goodin explained, this disclosure taught POSAs that Dockser FPPs could be implemented "with smaller than 32-bit registers to not waste circuit space or incur unnecessary cost in having some register elements that will always be unpowered." Appx 1302 (¶ 394); Appx7156; Appx8926; *see also* Appx721; Appx6428; Appx8405. Full precision was thus not fundamental to Dockser. Appx5057-5058; Appx7979-7980; Appx9758-9759.

Before the Board, Dr. Khatri never disputed Mr. Goodin's interpretation of Dockser's "formatted differently" disclosure. Appx5134 (¶ 59); Appx8056;

Appx9835. Now, Singular relies on attorney argument to dispute Mr. Goodin. Singular Br. 43-45. But "unsworn attorney argument...is not evidence and cannot rebut…other admitted evidence." *Gemtron Corp. v. Saint-Gobain Corp.*, 572 F.3d 1371, 1380 (Fed. Cir. 2009). The attorney argument is both wrong[2] and also a red herring as another aspect of Dockser straightforwardly confirms that full-precision capability is not fundamental to Dockser.

Specifically, the very paragraph the Board cited as demonstrating that full precision was fundamental to Dockser confirms the opposite. Dockser's paragraph [0003] says "for certain applications…a reduced precision ***may be acceptable***."

[2] Mr. Goodin agreed Dockser's ***exemplary*** embodiment uses 32-bit-wide registers, but he never said Dockser was limited to such registers. Appx4739-4742. And the claim by Singular's attorneys that POSAs would not have understood Dockser's reference to registers "formatted differently" to allow for smaller registers (Singular Br. 43-44) is flatly contradicted by Mr. Goodin and was never endorsed by Dr. Khatri. Appx 1302 (¶ 394); Appx7156; Appx8926. Singular's suggestion that Google "change[d]" (and waived) its interpretation of Dockser (Singular Br. 44) is also wrong; Google (and Mr. Goodin) have consistently argued that the disclosure confirms Dockser could be implemented with "smaller than 32-bit registers." Appx721; Appx6428; Appx8405; Opening Br. 58.

Appx1470; Appx80; Appx164; Appx251. And while the paragraph says that for "***general purpose*** processors…a greater precision ***may*** be needed," it also confirms that if "an application always requires a certain reduced precision, ***the floating-point processor can be designed and built to that reduced precision***." Appx1470. No reasonable factfinder—reading Dockser's entire disclosure—could conclude that full-precision capabilities are "fundamental" to Dockser.

Singular has no response to paragraph [0003] other than to suggest Dockser "reject[ed]" the prior-art low-precision processors it describes. Singular Br. 45. To the contrary, Dockser plainly recognized that low-precision processors existed and were suitable for certain applications. Singular's only other response is to argue that Google waived reliance on paragraph [0003] because Google allegedly did not discuss the paragraph below. Singular Br. 45. But Google is not pointing to some hitherto unknown portion of Dockser—it is pointing to the very passage the Board cited as the basis for its "fundamental"-feature finding. Regardless, Google (and Mr. Goodin) ***did*** explain below that Dockser's paragraph [0003] demonstrated that not all applications and processors require full precision. *E.g.*, Appx5133-5134 (¶ 58) (citing [0003]; "Other types of processors (not intended to be 'general purpose') may not [require full precision]."); Appx675; Appx5058; *see also* Appx1161 (¶ 193); Appx1230 (¶ 290). There was no waiver.

Finally, Singular (like the Board) cites Mr. Goodin's deposition testimony that Dockser's embodiments permit "selectable" precision and were not limited to a single subprecision. Singular Br. 43. As Google explained (Opening Br. 59-60), in neither passage did Mr. Goodin say Dockser requires full precision.

2. Tong is explicit that full-precision is "not essential."

As the Board recognized, "Tong discloses that [1] 'not all programs need the precision provided by generic FP hardware,' and [2] 'the fine precision of the 23-bit mantissa is not essential,' and [3] 'a single custom FP format may be a viable option' for particular applications." Appx81; Appx165; Appx253. These disclosures squarely state that full precision "***is not essential***," *i.e.*, not fundamental.

Singular has no response to the above-quoted disclosures. Singular Br. 45-47. Instead, Singular focuses on Tong's description of computers with both low-precision and full-precision processors, and its teaching that "some fraction" of operands require full precision. *Id*. Those disclosures merely confirm what Tong already says: if computers are intended "to be more ***generally useful***," they should perform both low- and full-precision operations. Appx1483. But Tong nowhere says ***all*** computers must be general-purpose computers—it explicitly says that "a single custom FP format may be a ***viable option***" for "application-specific task[s]." Appx1483. And supporting an application-specific task—*i.e.*, signal-processing—

was the context in which Google framed its Dockser-MacMillan-Tong combination. Opening Br. 54-57.

Google is not asking the Court to re-weigh the evidence. The conclusion that full precision is not "fundamental" to Tong is not one of several reasonable ones that could be drawn from the evidence—it is the only reasonable conclusion to be drawn.

B. Economic Concerns Would Not Have Discouraged POSAs from Implementing the Combination.

The Board's separate finding that customizing Dockser's FPPs would "increase costs due to added complexity and size" is legally incorrect and factually unsupported. Appx82; Appx167; Appx254.

First, the Board's finding is wrong as a matter of law because economic costs cannot defeat an otherwise technologically motivated combination. *Supra* Section I.B.

Second, the finding lacks support. The Board said that the combination "would add complexity because it involves a 'customized implementation.'" Appx82; Appx167; Appx254. The Board did not, however, cite ***any*** support for its assumption that customization adds complexity. As Mr. Goodin explained, customized components were conventional and advantageously "save space and power." Appx5136 (¶ 62); Appx8058; Appx9837. Even Dr. Khatri admitted customization "in the industry" is "done routinely and commonly." Appx5212.

Singular attempts to defend the Board's finding by pointing to one paragraph in Dr. Khatri's declaration in which he alleged that customizing Dockser's FPPs would require customized components, *e.g.*, "specialized customized registers," that would add complexity and therefore cost. Singular Br. 49 (citing Appx4998 (¶ 115)). But Dr. Khatri introduced no evidence that POSAs would consider customized components to add complexity or costs at all, much less the "significant complexity" MacMillan identifies or more than the "moderate costs" MacMillan accepts. As noted before, MacMillan's invention itself adds customized registers to its PEs and never says doing so adds significant complexity or more than moderate costs. Appx1500 (8:51-55), Appx1503 (14:52-62).

As for the Board's separate finding that apart from customization the control circuitry within Dockser's FPPs would "increase costs due to added complexity and size," the Board premised that finding on its earlier Dockser-MacMillan analysis. Appx82; Appx167; Appx254. The finding thus fails for the reasons discussed *supra* Section II.C. Moreover, the Board's finding ignores Google's argument (supported by Mr. Goodin) that customized FPPs would eliminate "waste[d] circuit ***space***" and "unnecessary ***cost***." Appx1302 (¶ 394); Appx7156; Appx8926; *see also* Appx5136-5137 (¶ 62); Appx8058-8059; Appx9837-9838. If size and costs are relevant, then they would have motivated POSAs to customize Dockser's FPPs.

Neither Singular nor the Board accounted for Google's cost/size-savings evidence, and thus neither contradicted it. Singular's only response now is to allege Google's cost/size-savings rationale was not raised below (Singular Br. 49-50); but Google's petitions argued POSAs would customize Dockser's FPPs, in part, to "not waste circuit space or incur unnecessary cost." Appx721; Appx6428; Appx8405.

Finally, Singular argues Google's customized Dockser-MacMillan-Tong combination is "Frankenstein"-like because Google's motivation-to-combine theory "was not based on embedded systems," but on laptops. Singular Br. 52. To the contrary, Google's theory for its ***customized*** Dockser-MacMillan-Tong combination was always premised on "an embedded system designed specifically for signal processing." Appx720-723; Appx6427-6430; Appx8404-8406.

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The Board's motivation-to-combine finding regarding Google's customized Dockser-MacMillan-Tong combination should be reversed, and remand is unnecessary for the reasons discussed *infra* Section III.

III. REMAND FOR THE BOARD TO RE-ASSESS SECONDARY-CONSIDERATIONS EVIDENCE IT ALREADY REJECTED IS UNNECESSARY.

With Singular's cross-appeals dismissed, the Board's findings regarding Singular's secondary-considerations evidence as applied to the "at-least-one" claims are final and "precluded from further adjudication." *Engel Indus., Inc. v. Lockformer*

Co., 166 F.3d 1379, 1383 (Fed. Cir. 1999). Those final findings also preclude the need for the Board to re-assess the same evidence on remand.[3]

A. The Board's Rejection of Singular's Skepticism and Praise Evidence Applies to the "Greater-Than-One" Claims.

Singular argued that Dr. Bates disclosed his "invention" to Google and that Google employees were initially skeptical of the "invention," but later praised it. Appx4635-4641; Appx7836-7842; Appx9614-9620. According to Dr. Khatri, the "invention" Dr. Bates disclosed was an "[redacted]" Appx5001 (¶ 123); Appx7924; Appx9702-9703. The Board found Singular's arguments unpersuasive.

For skepticism, the Board explained that the statements Singular cited concerned whether Dr. Bates' invention was "commercially valuable," but did "not show skepticism as to whether or how a problem could be solved or whether such applications would *work*." Appx39 (emphasis original); Appx128; Appx213-14. Because only the latter skepticism is relevant, the Board found Singular's evidence unpersuasive. Appx40; Appx128; Appx213-214; *WBIP, LLC v. Kohler Co.*, 829

[3] Singular did not dispute that remand is unnecessary to address its commercial-success, unexpected-results, or "computing device" arguments. Opening Br. 69-72.

F.3d 1317, 1335-36 (Fed. Cir. 2016). This finding applies to the "greater-than-one" claims because the nature of the skepticism will not change on remand.

Singular argues the Board's skepticism finding is inapplicable to the "greater-than-one" claims because "the Board was focused on the 'approximate nature' of the operations." Singular Br. 55. But the Board focused on approximate computing because that was what Singular said Google was skeptical about. Appx4639-4641; Appx7840-7842; Appx9618-9620. Singular never alleged Google was skeptical of the DESCRIPTION OF INVENTION aspect of Dr. Bates' "invention," which makes sense given that the record—including the patents' admitted prior art—confirms parallel processing had been around for decades. *E.g.*, Appx275 (3:17-4:21); Appx4086; Appx4098; Appx5153 (¶¶ 79-83); Appx9854-9859; Appx8075-8080.

As for praise, Singular relied on Dr. Bates's personal notes and Google emails. Appx4640-4641; Appx7841-7842; Appx9619-9620. The Board found the notes unpersuasive because they did "not mention any specific ideas or features that allegedly were praised, or why or for what they were being praised." Appx41; Appx129; Appx214. This finding applies to the "greater-than-one" claims; the notes will not become more specific on remand.

The Board found the Google e-mails were (1) "merely cordial statements," not "evidence of industry prais[e]"; and (2) they failed to "mention any specific ideas or features…that were being praised." Appx42; Appx130; Appx215. These

findings apply to the "greater-than-one" claims because the e-mails' lack of praise and specificity will not change when re-assessed through the lens of those claims.

Finally, Singular argues that the Board's skepticism and praise findings were focused on the "at-least-one" claims and that there is a separate "nexus" between the "greater-than-one" claims and Singular's skepticism and praise evidence. Singular Br. 55-56. But Singular never argued its evidence had more probative value for one set of claims than the other. Instead, as the Board recognized, Singular argued that its evidence had a "nexus" to the "Challenged Claims" generally, because the evidence was directed to their common "invention." Appx35; Appx124; Appx209; Appx4640-4641 ("nexus" exists with "the ***Challenged Claims***"); Appx5955-5956 ("skeptical that the ***invention*** would be workable or useful"; "praise was directed to Singular's ***invention***"); Appx7841-7842; Appx8126; Appx9619-9620; Appx9916. And Singular defined that invention as an DESCRIPTION OF INVENTION [redacted] Appx5001 (¶ 123); Appx7924; Appx9702-9703; Appx4636-4641; Appx7837-7842; Appx9615-9620. Accordingly, when the Board said Singular's evidence did not demonstrate skepticism or praise of Dr. Bates' invention, it understood the "invention" to include a DESCRIPTION OF INVENTION architecture, *i.e.*, one with "greater-than-one" LPHDR execution units.

B. The Board's Rejection of Singular's Copying Evidence Applies to the "Greater-Than-One" Claims.

Singular argued that Google copied Dr. Bates's "invention" and that a nexus between Singular's copying-evidence and the "claimed invention" was "presumed" because Google's "products are coextensive with the Challenged Claims." Appx4645-4647; Appx7846-7848; Appx9624-9626. The Board disagreed.

The Board found no presumed nexus because Google identified "material features" in Google's products that were "not part of" the "at-least-one" claims. Appx45-48; Appx133-136; Appx218-222. These same "material features" are also "not part of" the "greater-than-one" claims. Singular's only rebuttal is that "differing claim scope" may impact the Board's analysis (Singular Br. 60), but Singular makes no effort to show that its "greater-than-one" claims recite the additional material features the Board identified.

The Board also found Singular had not demonstrated an actual nexus existed, because Singular did not establish that Google's products practice the claims. Appx50; Appx138; Appx223-224. The Board said Singular relied on Dockser's use of 7 bits of mantissa to demonstrate that Google's products met the claims' "X and Y percentage [error] limitations," but had failed to explain how that analysis applies to Google's products. Appx49-50; Appx137-138; Appx223-224. This finding applies to the "greater-than-one" claims as they include the same "X and Y" limitations. Singular's only response is to argue it should have an opportunity to re-

do its case on remand. Singular Br. 59. But remand is not for mulligans. *Engel Indus.*, 166 F.3d at 1383.

IV. SINGULAR'S ALTERNATIVE BASIS FOR AFFIRMANCE RELIES ON MISINTERPRETING THE CLAIMS.

Singular's alternative basis for affirmance focuses on what Singular calls the "Exceeds Claims"[4] and applies to Google's Dockser-MacMillan combination[5], but not its customized Dockser-MacMillan-Tong combination. Singular Br. 60-61 n.5. Each Exceeds Claim recites a device wherein the number of LPHDR execution units within the device "exceeds" by a recited amount the number of "execution units in the device adapted to execute at least the operation of multiplication on floating point numbers that are at least 32 bits wide." *Id.* at 61. Singular calls the latter type of execution units "32-bit traditional-precision execution units." *Id.*

Because Dockser's FPPs can perform 32-bit floating-point multiplication, Singular argues the FPPs in Dockser-MacMillan are ***both*** LPHDR units ***and*** 32-bit

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[4] The "Exceeds Claims" are "greater-than-one" claims, but do not include claims 3-4, 7, 9, 25, and 34 of the '273 patent. Appx346-348. Those "greater-than-one" claims require multiple LPHDR units but do not require any 32-bit traditional-precision units.

[5] It also applies to Google's non-customized Dockser-MacMillan-Tong combination, but that combination rises-and-falls with Dockser-MacMillan.

traditional-precision units, and thus the Dockser-MacMillan device cannot have more LPHDR units than 32-bit traditional-precision units. *Id*. at 66. The Board rejected Singular's argument at institution (Appx4001-4004; Appx7693-7695; Appx9472-9475), and for good reason—it relies on a claim interpretation the specification does not support.

The specification draws a clear distinction between LPHDR execution units and 32-bit traditional-precision execution units. Starting with LPHDR units, the specification explains that "LPHDR arithmetic elements" are those that "***sometimes*** (or all of the time)" produce results that differ from "the correct result." Appx286-287 (26:61-27:4). The specification thus classifies LPHDR units as those designed to either always or sometimes produce imprecise results. This is why the Board found (and Singular no longer disputes) that Dockser's FPPs—which are capable of both low- and full-precision operations—are LPHDR units. Appx9-17, Appx27; Appx97-106; Appx115-116; Appx182-191; Appx201.

In contrast, when introducing the embodiment to which the Exceeds Claims are directed, the specification describes 32-bit traditional-precision execution units as those "arithmetic elements…designed to perform high dynamic range arithmetic of traditional precision (that is, floating point arithmetic with a word length of 32 or more bits)." Appx287 (28:9-16). Thus, unlike LPHDR units, 32-bit traditional-precision units are designed to produce the correct full-precision result ***all the time***.

As Mr. Goodin explained, POSAs would understand these contrasting disclosures to mean that 32-bit traditional-precision units are those "that do not 'sometimes' produce results different from the correct traditional-precision result." Appx1291-1292 (¶¶ 374-375); Appx7140-7141; Appx8896-8897. It follows that if an execution unit "sometimes" produces results that differ from that correct result (like Dockser's FPPs do), then that unit is an LPHDR unit, and is not what the specification describes as a 32-bit traditional-precision unit and distinguishes from LPHDR units. The Board agreed with Google in its institution decisions. Appx4001-4004; Appx7693-7695; Appx9472-9475.

Singular does not acknowledge the specification. Instead, Singular focuses on the phrase "adapted to." Because Dockser's (non-customized) FPPs ***can*** perform 32-bit floating-point multiplication, Singular argues they are "adapted to" do so and thus are 32-bit traditional-precision units. But Singular impermissibly reads "adapted to" in a vacuum without considering the specification's distinction between execution units adapted to "sometimes" produce incorrect results (and thus "sometimes" produce correct results), and those that are adapted to always produce the correct traditional-precision result. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1315 (Fed. Cir. 2005) (en banc). In view of the specification, an execution unit is "adapted

to," *i.e.*, designed to[6], "execute at least the operation of multiplication on floating point numbers that are at least 32 bits wide" when it is designed to always produce the correct traditional-precision result and not sometimes produce incorrect results. Any other reading eliminates the specification's distinction between the two types of execution units.

Recognizing that its interpretation fails to distinguish between LPHDR and 32-bit traditional-precision units, Singular argues such a result is acceptable because a single structure ***can*** meet two different claim elements. Singular Br. 65. But that is the exception, not the rule. "Where a claim lists elements separately, the clear implication of the claim language is that those elements are distinct components of the patented invention." *Becton, Dickinson & Co. v. Tyco Healthcare Grp.*, 616 F.3d 1249, 1254 (Fed. Cir. 2010) (cleaned up). That implication is even stronger here because the specification makes explicit that LPHDR and 32-bit traditional-precision execution units are separate components. *HTC Corp. v. Cellular Commc'ns Equip., LLC*, 701 F. App'x 978, 982 (Fed. Cir. 2017) ("The specification reinforces the inference that [two elements] are separate components.").

[6] Singular says "adapted to" can mean "designed to" or "capable of." Singular Br. 64. Here, the specification makes clear that "designed to" is the proper meaning. Appx287 (28:9-21) ("designed to perform…arithmetic of traditional precision").

Google originally identified Singular's "adapted to" argument as one for remand (Opening Br. 54 n.9), but Google agrees with Singular that the Court can and should resolve the legal dispute now. And if the Court agrees with Google that 32-bit traditional-precision execution units cannot also be LPHDR execution units, then Google's Dockser-MacMillan combination meets the Exceeds Claims, and there is no need for remand if the Court also agrees that the Board's motivation-to-combine finding should be reversed for the reasons discussed *supra* Section I.

CONCLUSION

The Court should reverse the Board's finding that Google had not proven the "greater-than-one" claims unpatentable.

Respectfully submitted,

Date: February 3, 2023

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CERTIFICATE OF COMPLIANCE

The Corrected Reply Brief of Appellant complies with the length limits set forth in Fed. Cir. R. 32(a). Specifically, this brief contains 6,998 words, excluding the parts of the brief exempted by Fed. R. App. P. 32(f) and Fed. Cir. R. 32(b), as determined by the word count feature of the word processing program used to create the brief.

This brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type-style requirements of Fed. R. App. P. 32(a)(6). This brief has been prepared using a proportionally spaced typeface using Microsoft Word for Microsoft Office 365, 14-point Times New Roman font.

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CERTIFICATE OF SERVICE AND FILING

I hereby certify that a true and correct copy of the foregoing **Corrected Reply Brief for Appellant (confidential and non-confidential versions)** has been electronically filed with the Clerk of Court using the CM/ECF system, which will serve via e-mail notice of such filing to all counsel registered as CM/ECF users, including counsel for Appellee:

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Additionally, confidential copies will be served via e-mail only to counsel for Appellee on this 3rd day of February 2023. Counsel for Appellee has consented in writing to electronic service via e-mail pursuant to Fed. R. App. P. 25(c)(2) and Fed. Cir. R. 25(e)(4).

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